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Effect of SSPs and RCPs on the forest resources use

Pekka Lauri[1,*]
[1)] International Institute for Applied Systems Analysis (IIASA)
[*)] Corresponding author, pekka.lauri@iiasa.ac.at

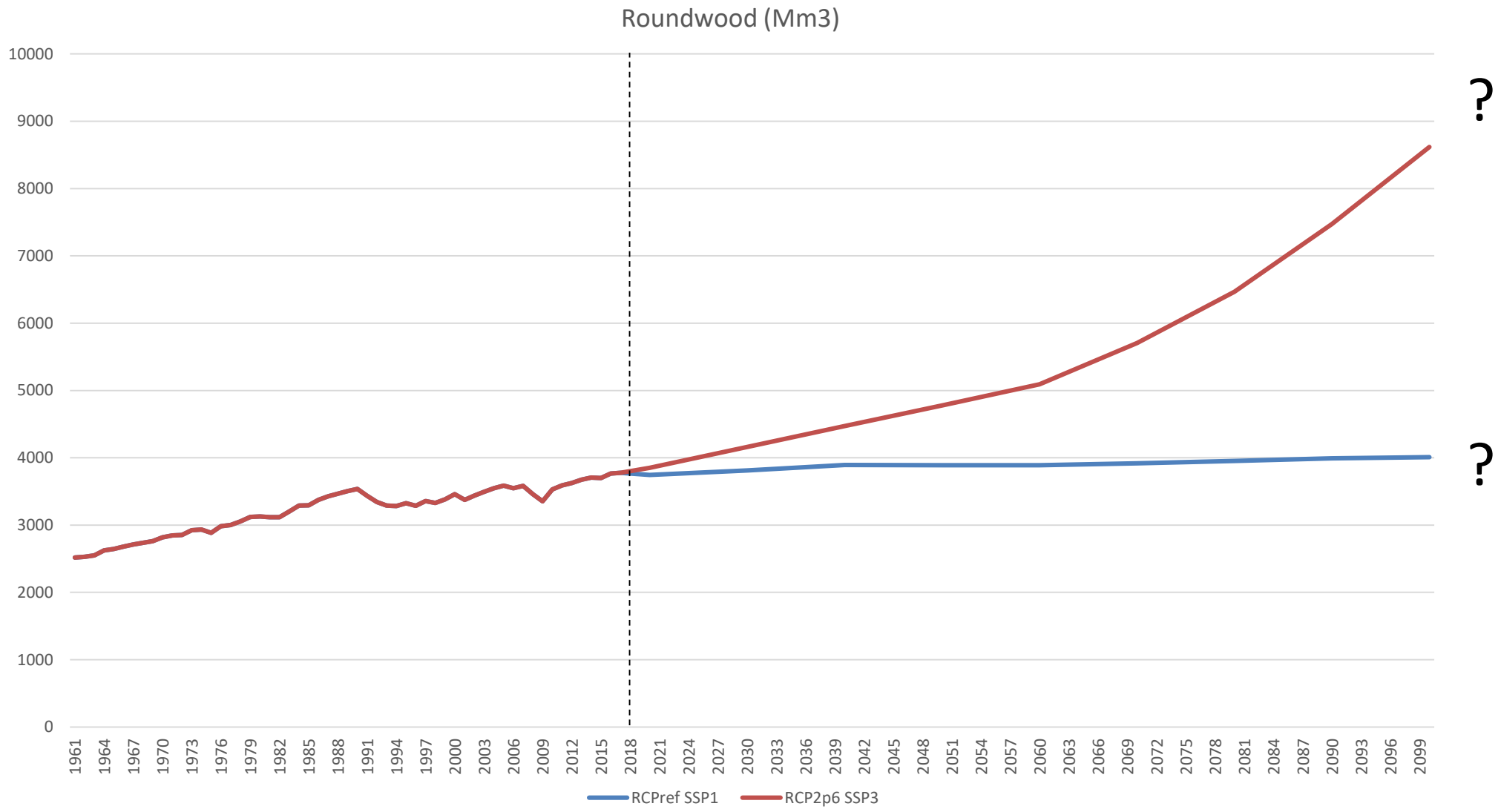
- Purpose: Consider effects of Shared Socioeconomic Pathways (SSPs) and Representative Concentration Pathways (RCPs) on forest resources use.

- Method: Solve GLOBIOM model for different SSP-RCP scenarios and compare roundwood harvest volumes. Interpret harvest volumes as approximation of forest resources use and the effect on natural forests ecosystems.

- Results:

  1) SSPs affect roundwood harvest volumes almost as much as RCPs.
  2) Effect of RCPs can be controlled by carbon tax on forest management while it is more difficult to control effect of SSPs.

Global roundwood harvest volumes 1960-2100



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Why harvest volumes increase in the future ?

1) Socioeconomic development (SSPs)

-POP and GDP growth

POP ↑ => industrial roundwood and fuelwood demand ↑ => roundwood harvest volumes ↑

GDP ↑ => industrial roundwood demand ↑ (positive income-elasticity)

fuelwood demand ↓ (negative income-elasticity)

=> roundwood harvest volumes ↑ ↓

-other effects of SSPs ignored (no quantitative data available)

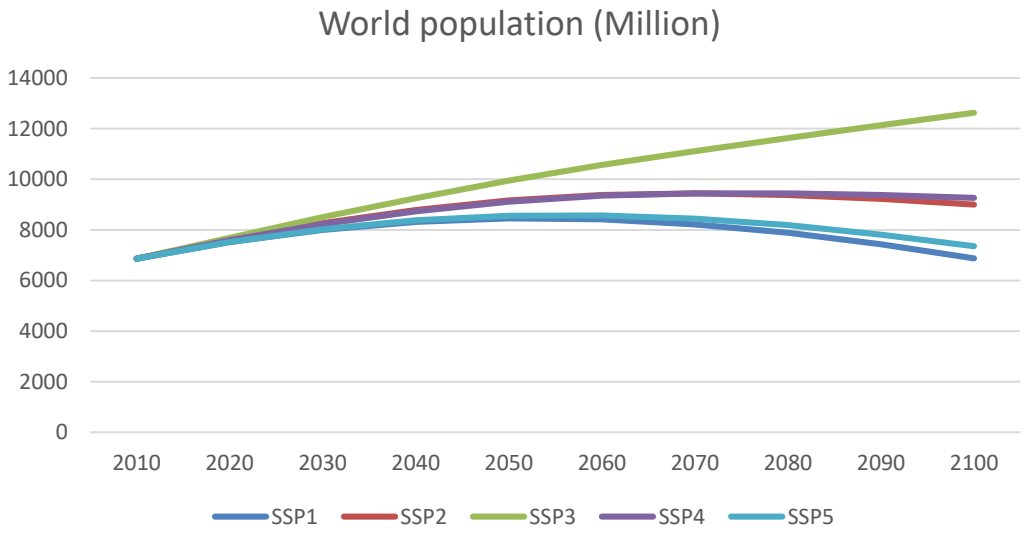
2) Climate mitigation (RCPs)

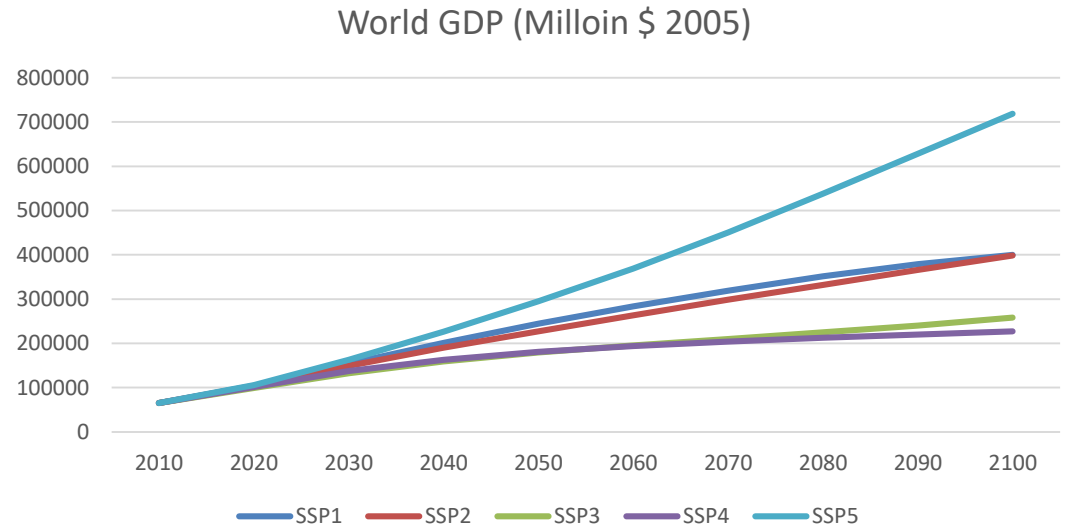
-bioenergy demand and carbon prices

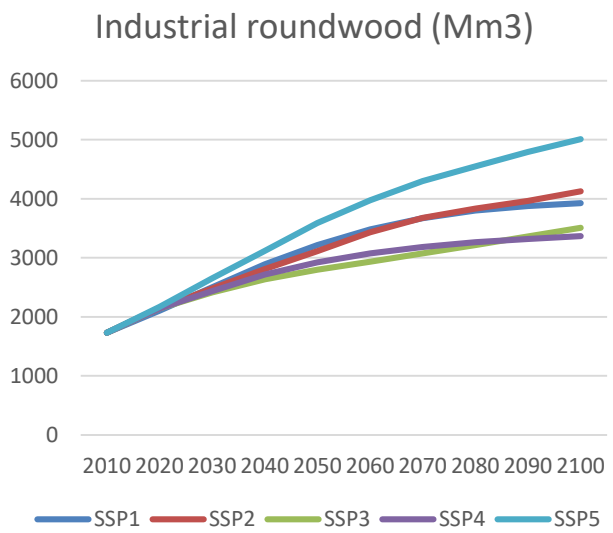
bioenergy demand ↑ => roundwood use for energy ↑ => roundwood harvest volumes ↑

carbon price ↑ => roundwood harvest volumes ↓ (if carbon tax on forest management)

Effect of SSPs (for RECref): POP + GDP growth







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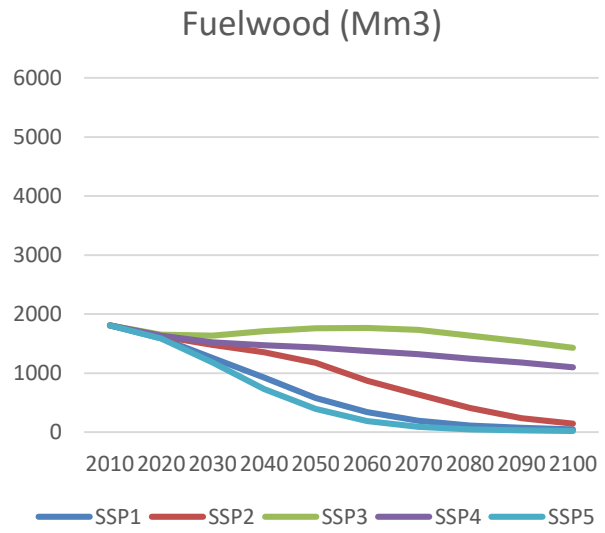

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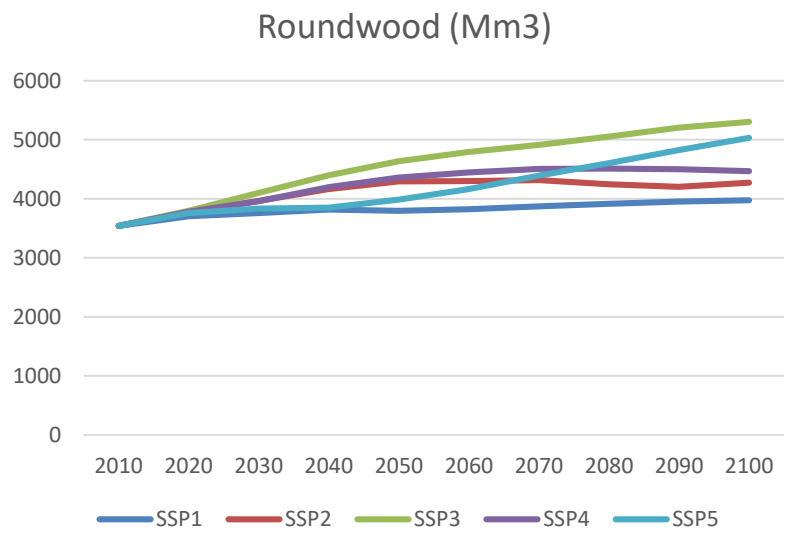
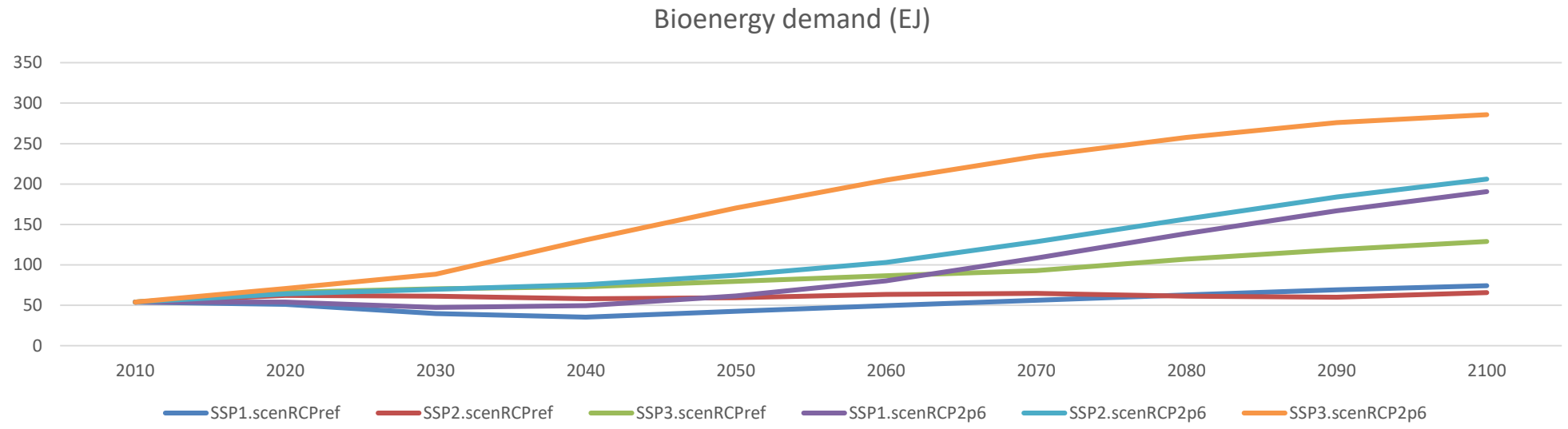
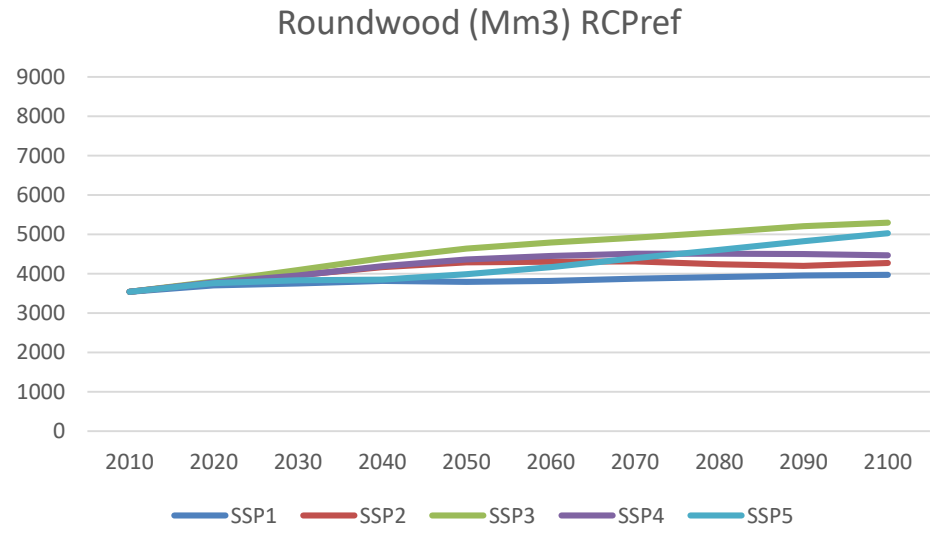
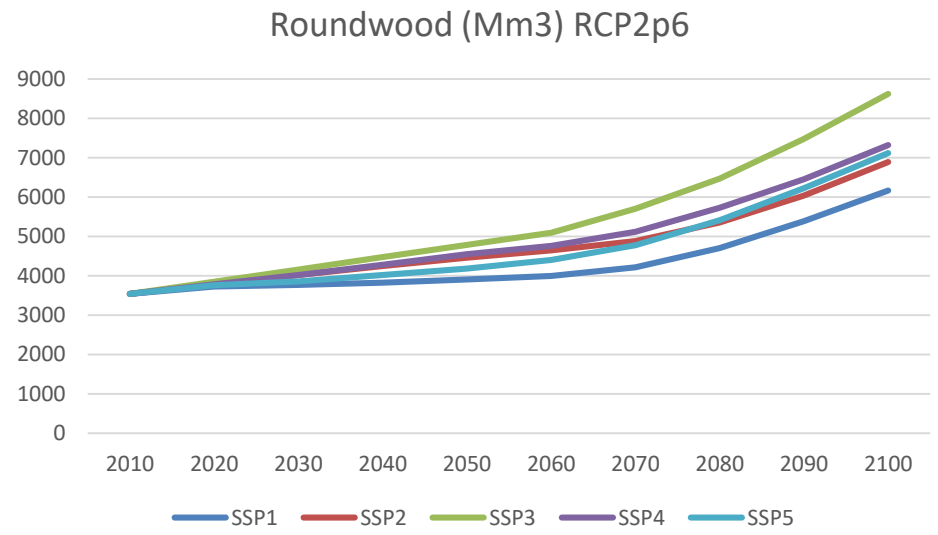


Effect of RCPs: bioenergy demand







Carbon tax on forest management

-tax on permanent decrease of carbon stock due to forest management

tax= carbon price x carbon stock change

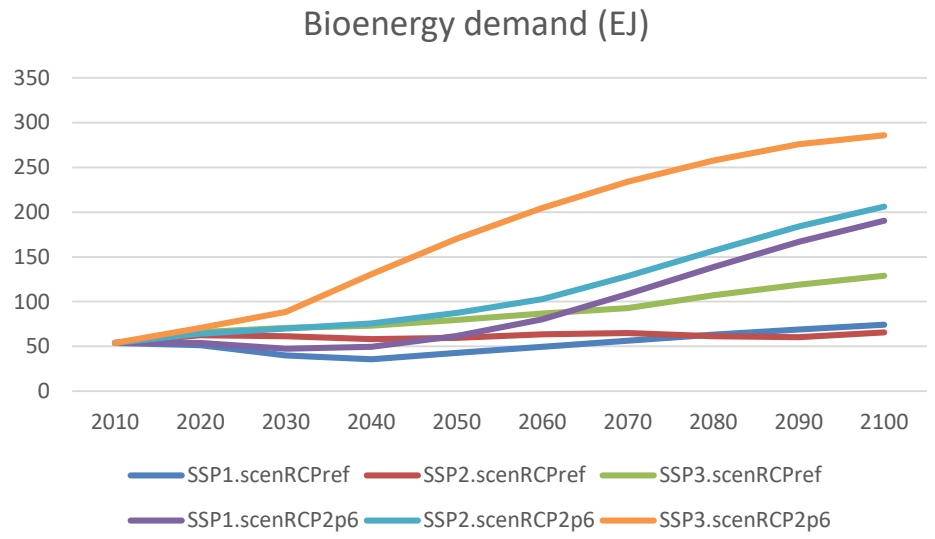
-carbon stocks changes based on G4M estimates of above and below ground living biomass

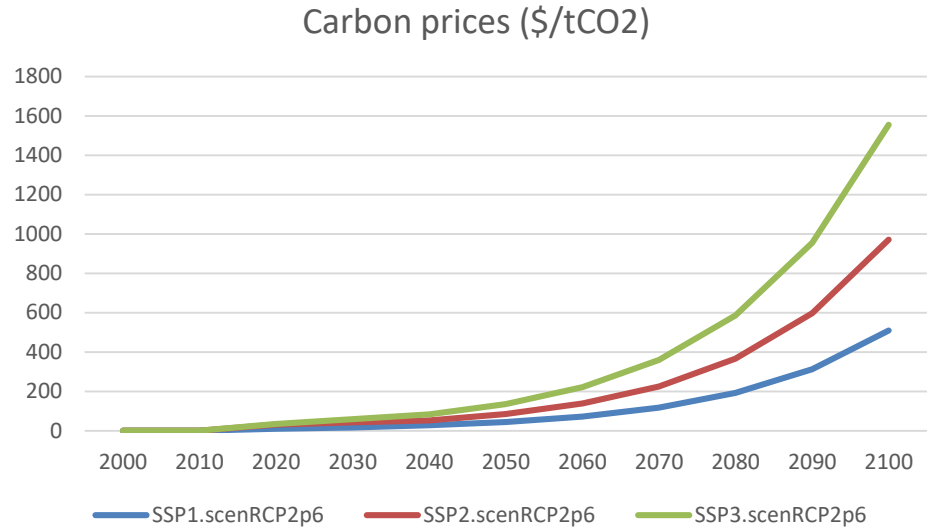
-carbon tax decreases roundwood use for energy but not much roundwood material use

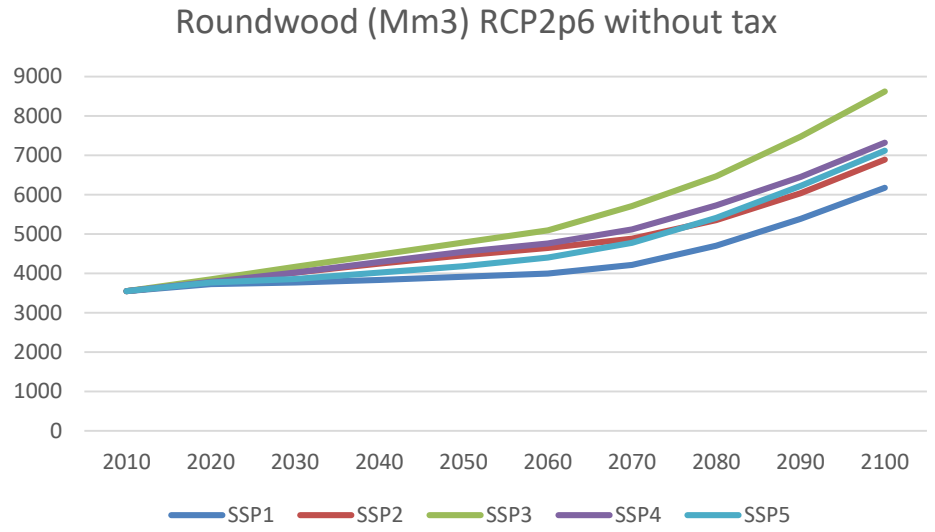
=> Roundwood use for energy more elastic than roundwood use for material products

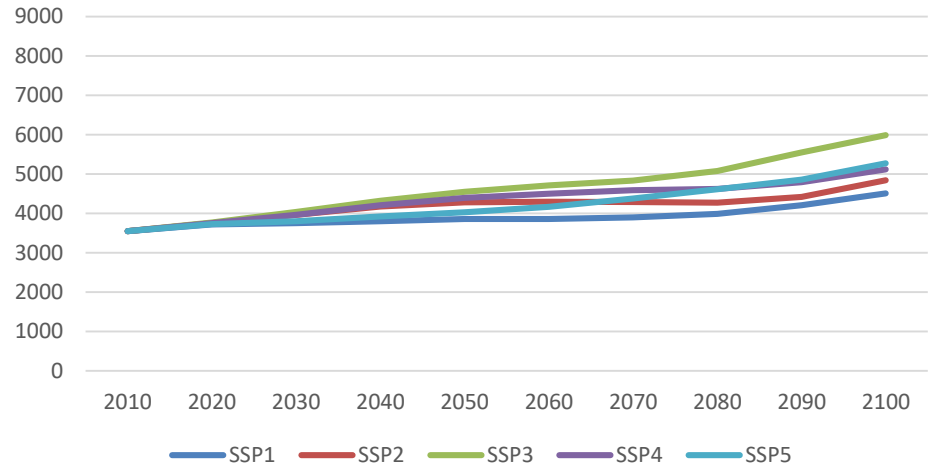
=> In energy use roundwood can be substituted easily by other feedstocks (residues, energy crops) while in material use it is more difficult.

Effect of RCPs with carbon tax on forest management









Conclusions

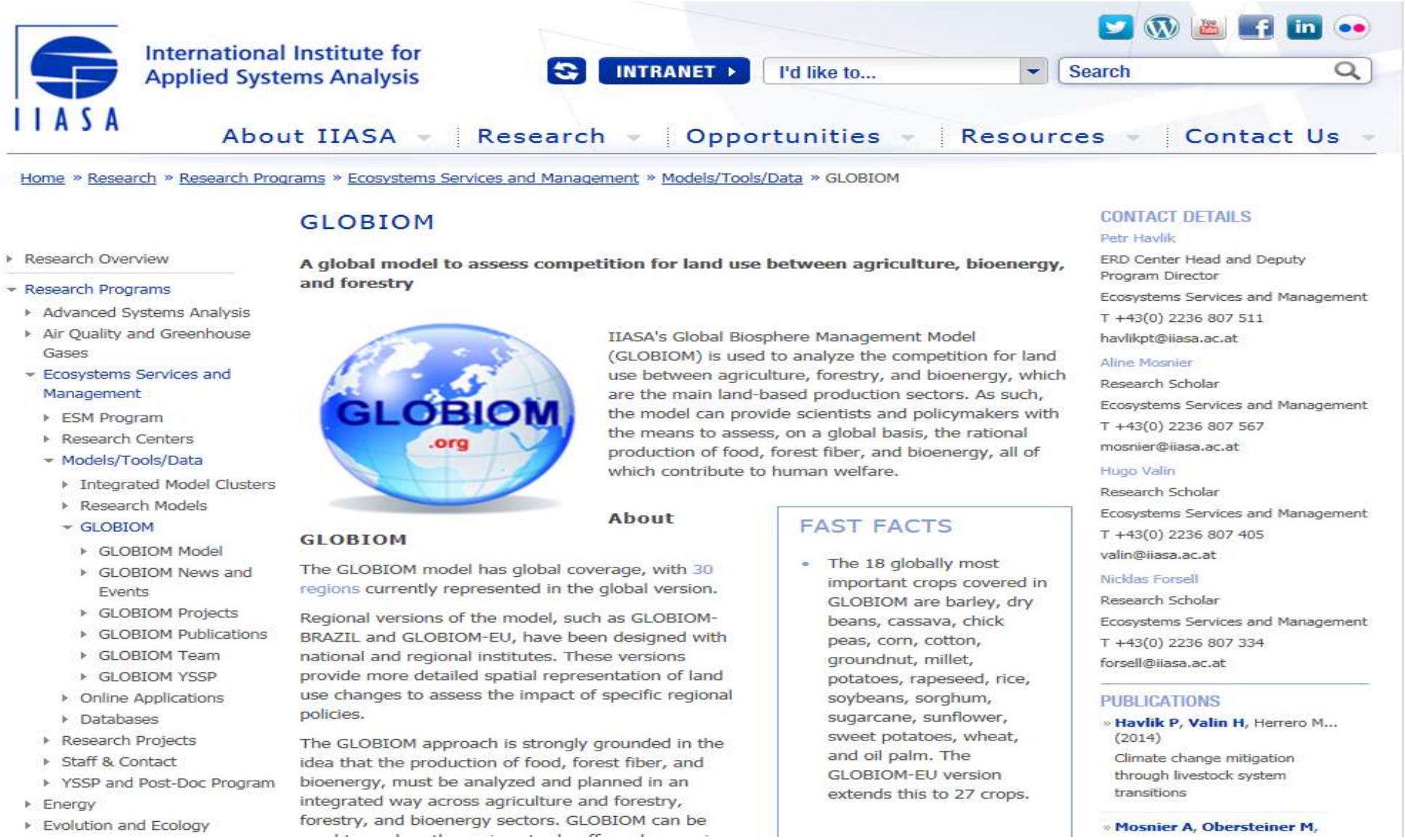
1) Socioeconomic development affects global forest resources use almost as much as climate mitigation
 -variation between RCPs +0-60% relative to RCPref
 -variation between SSPs +0-40% relative to SSP1

2) The effect of climate mitigation can be decreased significantly by carbon tax on forest management
 -variation between RCPs with tax +0-10% relative to RCPref
 -variation between SSPs with tax +0-35% relative to SSP1

3) Socioeconomic development (SSPs) might cause a larger threat for natural forests ecosystems than climate mitigation (RCPs), because it is more difficult to control forest resources material use by carbon tax policy.

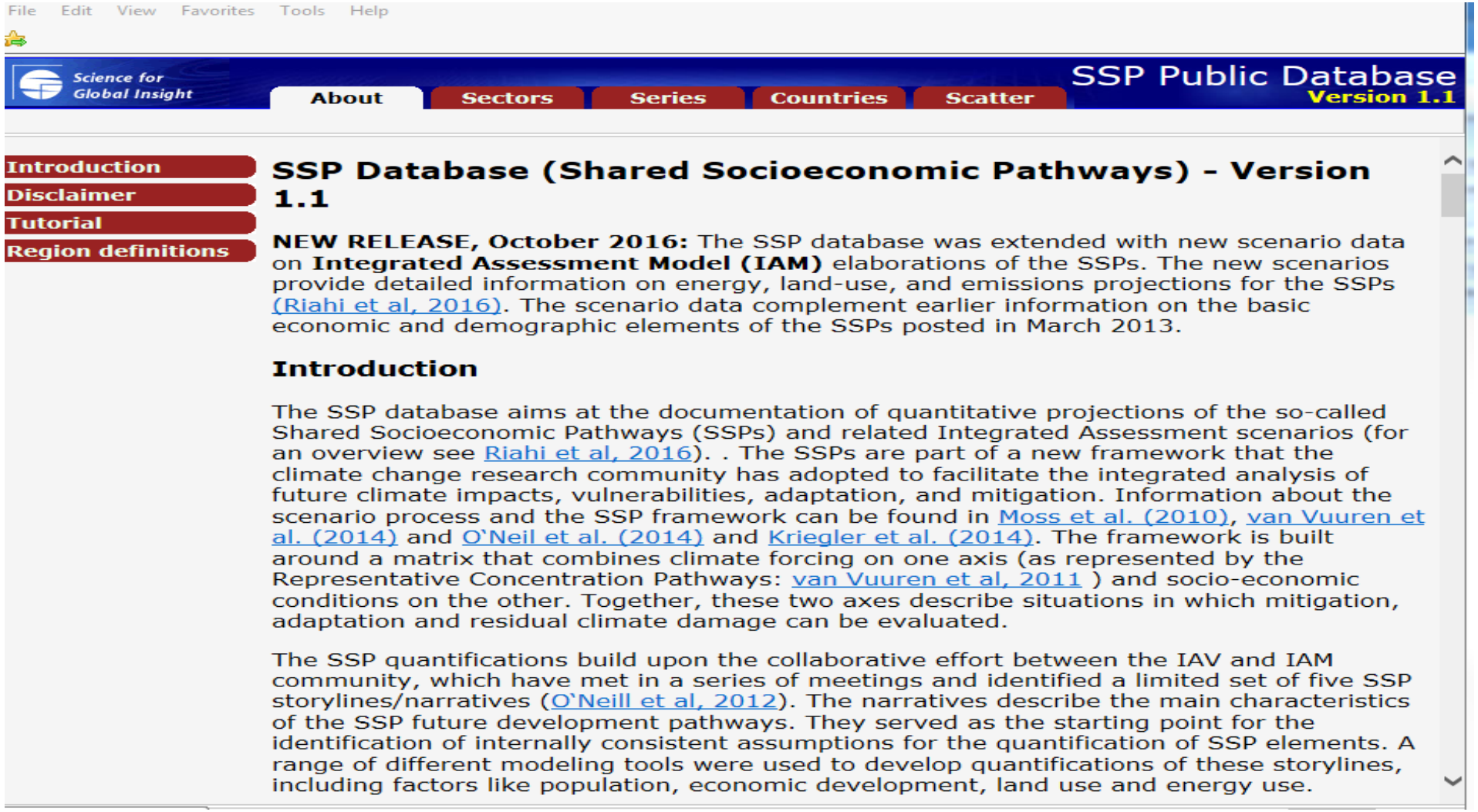
GLOBIOM model

http://www.globiom.org/

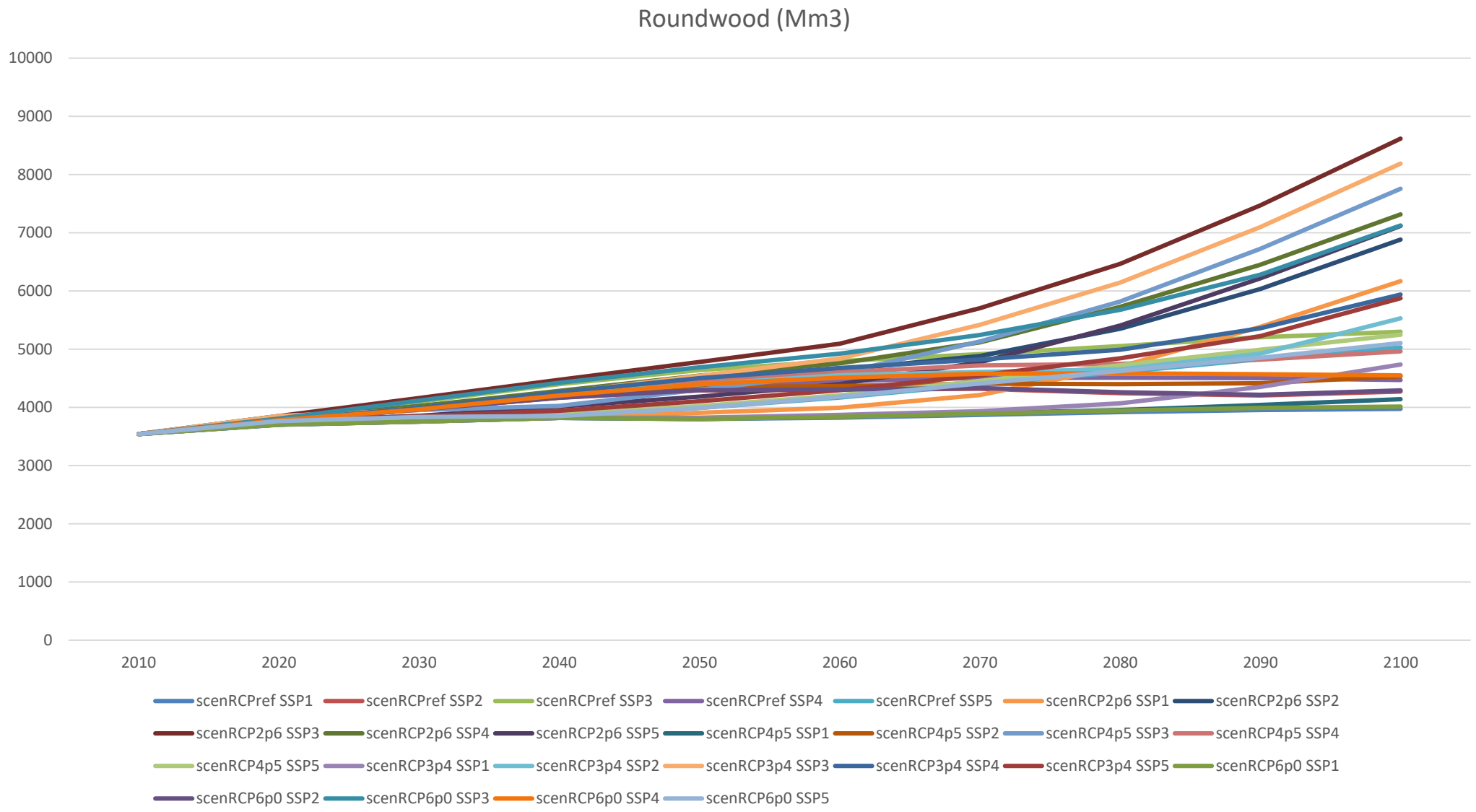


SSP-RCP scenario data

SSP database: https://tntcat.iiasa.ac.at/SspDb/



All SSP-RCP scenarios



Lauri et al. (2017): RCP2p6 increases global forest resources use 60% comparing to RCPref in SSP2

Forest Policy and Economics 83 (2017) 121–130

Contents lists available at ScienceDirect

Forest Policy and Economics

journal homepage: www.elsevier.com/locate/forpol

Impact of the 2 °C target on global woody biomass use

Pekka Lauri[a,*], Nicklas Forsell[a], Anu Korosuo[a], Petr Havlík[a], Michael Obersteiner[a], Annika Nordin[b]

[a] International Institute for Applied Systems Analysis (IIASA), Schlossplatz 1, A-2361 Laxenburg, Austria
[b] Swedish University of Agricultural (SLU), Umeå, Sweden

ABSTRACT

In this study we investigate the implications of reaching the 2 °C climate target for global woody biomass use by applying the Global Biosphere Management Model (GLOBIOM) and the recently published SSP-RCP scenario calculations. We show that the higher biomass demand for energy needed to reach the 2 °C target can be achieved without significant distortions to woody biomass material use and that it can even benefit certain forest industries and regions. This is because the higher woody biomass use for energy increases the demand for forest industry by-products, which makes forest industry final products production more profitable and compensates for the cost effect of increased competition over raw materials. The higher woody biomass use for energy is found to benefit sawnwood, plywood and chemical pulp production, which provide large amounts of by-products, and to inhibit fiberboard and mechanical pulp production, which provide small amounts of by-products. At the regional level, the higher woody biomass use for energy is found to benefit material production in regions, which use little roundwood for energy (Russia, North-America and EU28), and to inhibit material production in regions, which use large amounts of roundwood for energy (Asia, Africa and South-America). Even if the 2 °C target increases harvest volumes in the tropical regions significantly compared to the non-mitigation scenario, harvest volumes remain in these regions at a relatively low level compared to the harvest potential.